

CLAIMS

What is claimed is:

1. A method for detecting a potential for a vehicle rollover event, the method comprising the steps of:
 - determining a lateral kinetic energy of the vehicle based on vehicle longitudinal velocity and vehicle side slip angle;
 - measuring a lateral acceleration of the vehicle;
 - measuring a tire load;
 - determining a rollover potentiality index based on the lateral kinetic energy and the lateral acceleration;
 - determining a rollover index by weighting the rollover potentiality index by a factor of the lateral acceleration and a factor of the tire load; and
 - determining if the rollover index is above a predetermined threshold.
2. The method defined in Claim 1 wherein the measured tire load is a tire normal load.
3. The method defined in Claim 1 wherein the measured tire load is determined by measuring a length of a contact patch of a vehicle tire and measuring changes to the contact patch length.
4. The method defined in Claim 3 wherein the length of the contact patch is quantified by at least one of an accelerometer, a pressure sensing mechanism, and a temperature sensing mechanism.

5. The method defined in Claim 1 wherein lateral acceleration of the vehicle is sensed using a lateral acceleration sensor;
the method further comprising sensing a yaw rate of the vehicle, sensing a speed of the vehicle, sensing a steering wheel angle of the vehicle, and factoring the speed of the vehicle and the steering wheel angle of the vehicle into the rollover index determination.
6. The method defined in Claim 1 further comprising the step of providing a control signal from a controller configured to output a control signal to a system of the vehicle to implement corrective action to reduce the potential of an actual rollover when the rollover index is above a predetermined threshold.
7. The method defined in Claim 6 wherein the corrective action includes at least one of engine torque reduction, a steering wheel angle adjustment, and a suspension adjustment.
8. The method defined in Claim 7 wherein the engine torque reduction includes at least one of a change in engine output and actuation of vehicle brakes.
9. The method defined in Claim 1 wherein the lateral acceleration of the vehicle is measured by an accelerometer attached to a center of gravity of the vehicle.

10. An apparatus for detecting a rollover event for a vehicle comprising:
a lateral acceleration sensor for sensing a lateral acceleration of the vehicle;
a yaw rate sensor for sensing a yaw rate of the vehicle;
a sensor for sensing a speed of the vehicle;
a steering wheel sensor for sensing a steering wheel angle of the vehicle;
a tire load sensing mechanism for measuring a tire load; and
a controller that is programmed with a dynamic vehicle model, the controller being configured to determine a rollover index using at least one of the sensed lateral acceleration, yaw rate, vehicle speed, steering wheel angle, and tire load, and determine if the rollover index is above a predetermined threshold, the controller being further configured to output a control signal to a system of the vehicle to implement a corrective action to reduce the potential of an actual rollover when the rollover index is above the predetermined threshold.

11. The apparatus defined in Claim 10 wherein the corrective action includes at least one of engine torque reduction, a steering wheel angle adjustment, and a suspension adjustment.

12. The apparatus defined in Claim 11 wherein the engine torque reduction includes at least one of a change in engine output and actuation of vehicle brakes.

13. The apparatus defined in Claim 10 further comprising an accelerometer attached to a center of gravity of the vehicle for measuring the lateral acceleration of the vehicle.

14. The apparatus defined in Claim 10 wherein the dynamic vehicle model includes a vehicle nominal height and a vehicle half track width.

15. An apparatus for detecting a rollover event for a vehicle comprising:
- a lateral acceleration sensor for sensing a lateral acceleration of the vehicle;
 - a yaw rate sensor for sensing a yaw rate of the vehicle;
 - a sensor for sensing the speed of the vehicle;
 - a steering wheel sensor for sensing a steering wheel angle of the vehicle;
 - a tire load sensing mechanism for measuring a tire load; and
 - a controller configured to factor the speed of the vehicle and the steering wheel angle of the vehicle into the rollover index determination defined in Claim 1.